LISTING OF THE CLAIMS

1. (Currently Amended) A sub-harmonic generator, comprising:

an input filter operable to receive an input signal containing frequencies from among a first range and to produce a first intermediate signal containing frequencies from among a second range;

a signal divider circuit operable to receive the first intermediate signal and to produce a square wave signal containing square wave signal components at fundamental frequencies from among a third range, the third range of frequencies being about one octave below the second range of frequencies;

a wave-shaping circuit operable to receive the square wave signal and to attenuate frequencies substantially outside the third range to produce a second intermediate signal containing sinusoidal signal components from among frequencies corresponding to the respective fundamental frequencies of the square wave signal components;

an RMS detector operable to produce an RMS signal corresponding to an instantaneous amplitude of the first intermediate signal; and

a voltage controlled amplifier operable to amplify the second intermediate signal by an amount proportional to the RMS signal to produce a sub-harmonic signal.

2. (Original) The sub-harmonic generator of claim 1, further comprising a summing circuit operable to receive a stereo signal including a left channel signal and a right channel signal, and to aggregate the left and right channel signals to produce the input signal.

3. (Original) The sub-harmonic generator of claim 1, wherein the input filter is a band-pass filter.

4. (Original) The sub-harmonic generator of claim 3, wherein the band-pass filter includes a low pass filter having a first corner frequency and a high pass filter having a second corner frequency, the first corner frequency being greater than the second corner frequency.

5. (Original) The sub-harmonic generator of claim 4, wherein the low pass filter is operable to receive the input signal and to produce a low pass signal, and the high pass filter is operable to

receive the low pass signal and to produce the first intermediate signal.

6. (Original) The sub-harmonic generator of claim 3, wherein the band-pass filter is operable to pass frequencies in the second range, the second range being contained within the first range.

7. (Original) The sub-harmonic generator of claim 6, wherein the band-pass filter includes a low corner frequency of about 40 Hz and a high corner frequency of about 110 Hz such that the second range is about 40-110 Hz.

8. (Original) The sub-harmonic generator of claim 6, wherein the band-pass filter includes a low corner frequency of about 56 Hz and a high corner frequency of about 96 Hz such that the second range is about 56-96 Hz.

9. (Original) The sub-harmonic generator of claim 1, wherein the signal divider circuit includes a zero crossing detector operable to produce a zero crossing signal that transitions each time the first intermediate signal substantially matches a reference potential.

10. (Original) The sub-harmonic generator of claim 9, wherein the zero crossing detector includes a comparator circuit operable to compare respective amplitudes of the reference potential and the first intermediate signal, and to cause the zero crossing signal to transition each time the amplitude of the reference potential substantially equals the first intermediate signal, the comparator circuit including a hysteresis circuit operable to adjust the amplitude of the reference potential each time the zero crossing signal transitions.

11. (Original) The sub-harmonic generator of claim 9, wherein the signal divider circuit further includes a frequency divider circuit operable to receive the zero crossing signal and to produce the square wave signal such that it transitions one time each time the zero crossing signal transitions two times.

12. (Original) The sub-harmonic generator of claim 11, wherein the square wave signal transitions between two substantially fixed voltage levels.

13. (Original) The sub-harmonic generator of claim 11, wherein the frequency divider includes one of an edge sensitive flip-flop circuit and a level sensitive flip-flop circuit, the flip-flop circuit being operable to receive the zero crossing signal and to produce the square wave signal such that it transitions one time each time the zero crossing signal transitions two times.

14. (Original) The sub-harmonic generator of claim 11, wherein the third range of frequencies is about 20 Hz to about 55 Hz.

15. (Original) The sub-harmonic generator of claim 11, wherein the third range of frequencies is about 28 Hz to about 48 Hz.

16. (Original) The sub-harmonic generator of claim 1, wherein the wave-shaping circuit includes at least one band-pass filter operable to receive the square wave signal and to attenuate frequencies substantially outside the third range such that the second intermediate signal contains the sinusoidal signal components at frequencies corresponding to the respective fundamental frequencies of the square wave signal components.

17. (Original) The sub-harmonic generator of claim 16, wherein the wave-shaping circuit includes a plurality of band-pass filters, each receiving the square wave signal and having a respective center frequency such that a sum of outputs of the band-pass filters substantially exclude frequencies outside the third range.

18. (Original) The sub-harmonic generator of claim 17, wherein the wave-shaping circuit includes first and second band-pass filters, the first band-pass filter having a center frequency within about 25 to about 35 Hz and the second band-pass filter having a center frequency within about 40 Hz to about 50 Hz.

19. (Original) The sub-harmonic generator of claim 18, wherein the first band-pass filter has a Q-factor within about 3.0 to about 3.5 and the second band-pass filter has a Q-factor within about 3.5 to about 4.5.

20. (Original) The sub-harmonic generator of claim 16, wherein the at least one band-pass filter includes a selectable center frequency such that the attenuated frequencies substantially outside the third range are adjustable.

21. (Original) The sub-harmonic generator of claim 1, further comprising:
at least one band-pass filter operable to receive the input signal and to produce a third intermediate signal containing frequencies from among a fourth range, the fourth range of frequencies including at least some frequencies above the third range of frequencies;

an amplifier operable to increase an amplitude of the third intermediate signal to produce a fourth intermediate signal; and

a summation circuit operable to sum the sub-harmonic signal and the fourth intermediate signal to produce at least a portion of an output signal.

22. (Original) The sub-harmonic generator of claim 21, wherein the at least one band-pass filter includes first, second and third band-pass filters such that a sum of outputs of the first, second, and third band-pass filters exclude frequencies substantially outside the fourth range, the first band-pass filter having a center frequency within about 35 Hz to about 45 Hz, the second band-pass filter having a center frequency within about 55 Hz to about 65 Hz, and the third band-pass filter having a center frequency within about 95 Hz to about 105 Hz.

23. (Original) The sub-harmonic generator of claim 22, wherein the first band-pass filter has a center frequency of about 40 Hz, the second band-pass filter has a center frequency of about 58 Hz, and the third band-pass filter has a center frequency of about 98 Hz.

24. (Original) The sub-harmonic generator of claim 23, wherein the first band-pass filter has a Q-factor within about 1.5 to about 2.0, the second band-pass filter has a Q-factor within about 1.75 to about 2.25, and the third band-pass filter has a Q-factor within about 1.75 to about 2.25.

25. (Original) The sub-harmonic generator of claim 21, further comprising an adjustment control operable to vary the magnitude of the third intermediate signal.

26. (Original) The sub-harmonic generator of claim 21, further comprising a low pass filter operable to (i) receive the sub-harmonic signal; and (ii) attenuate frequencies substantially below the third range to produce a filtered sub-harmonic signal, the summation circuit being further operable to sum the filtered sub-harmonic signal and the fourth intermediate signal to produce at least a portion of the output signal.

27. (Original) The sub-harmonic generator of claim 5, further comprising:
at least one further band-pass filter operable to receive the input signal and to produce a third intermediate signal containing frequencies from among a fourth range, the fourth range of frequencies including at least some frequencies above the third range of frequencies;

an amplifier operable to increase an amplitude of the third intermediate signal to produce a fourth intermediate signal; and

a summation circuit operable to sum (i) the sub-harmonic signal; (ii) the fourth intermediate signal; and (iii) the low pass signal to produce at least a portion of the output signal.

28. (Original) The sub-harmonic generator of claim 2, further comprising:
at least one band-pass filter operable to receive the input signal and to produce a third intermediate signal containing frequencies from among a fourth range, the fourth range of frequencies including at least some frequencies above the third range of frequencies;

an amplifier operable to increase an amplitude of the third intermediate signal to produce a fourth intermediate signal;

a left channel summation circuit operable to sum the left channel signal and the fourth intermediate signal to produce at least a portion of a left channel output signal; and

a right channel summation circuit operable to sum the right channel signal and the fourth intermediate signal to produce at least a portion of a right channel output signal.

29. (Original) The sub-harmonic generator of claim 2, further comprising stereo width expansion circuit operable to (i) cancel energy at at least some frequencies from among a fourth range of frequencies from the left channel signal to produce at least a portion of a left channel output signal; and (ii) cancel energy at at least some frequencies from among a fifth range of frequencies

from the right channel signal to produce at least a portion of a right channel output signal.

30. (Original) The sub-harmonic generator of claim 29, wherein the stereo width expansion circuit includes:

a left channel band-pass filter having a center frequency at about a mid-frequency of the fifth range of frequencies, the left channel band-pass filter being operable to produce an inverted left channel signal containing a band of frequencies from among the fifth range of frequencies;

a right channel band-pass filter having a center frequency at about a mid-frequency of the fourth range of frequencies, the right channel band-pass filter being operable to produce an inverted right channel signal containing a band of frequencies from among the fourth range of frequencies;

a left channel summation circuit operable to sum at least the left channel signal and the inverted right channel signal to produce at least a portion of the left channel output signal; and

a right channel summation circuit operable to sum at least the right channel signal and the inverted left channel signal to produce at least a portion of the right channel output signal.

31. (Original) The sub-harmonic generator of claim 30, wherein:

the inverted left channel signal has frequency, amplitude and phase characteristics such that energy of the right channel signal at frequencies from among the fifth range of frequencies are substantially attenuated when the right channel signal and the inverted left channel signal are summed to produce at least a portion of the right channel output signal; and

the inverted right channel signal has frequency, amplitude and phase characteristics such that energy of the left channel signal at frequencies from among the fourth range of frequencies are substantially attenuated when the left channel signal and the inverted right channel signal are summed to produce at least a portion of the left channel output signal.

32. (Original) The sub-harmonic generator of claim 30, wherein a center frequency of one of the left channel band-pass filter and the right channel band-pass filter is within about 175 Hz to about 225 Hz and a center frequency of the other of the left channel band-pass filter and the right channel band-pass filter is within about 150 Hz to about 200 Hz.

33. (Original) The sub-harmonic generator of claim 30, wherein a center frequency of one of

the left channel band-pass filter and the right channel band-pass filter is about 200 Hz and a center frequency of the other of the left channel band-pass filter and the right channel band-pass filter is about 175 Hz.

34. (Original) The sub-harmonic generator of claim 30, wherein:

the stereo width expansion circuit further includes a left channel high-pass filter operable receive the left channel signal and to produce a left channel high pass signal containing frequencies from among those at or above a first corner frequency, and a right channel high-pass filter operable to receive the right channel signal and to produce a right channel high pass signal containing frequencies from among those at or above a second corner frequency;

the left channel summation circuit is further operable to sum at least the left channel signal, the inverted right channel signal, and the left channel high pass signal to produce at least a portion of the left channel output signal; and

the right channel summation circuit is further operable to sum at least the right channel signal, the inverted left channel signal, and the right channel high pass signal to produce at least a portion of the right channel output signal.

35. (Original) The sub-harmonic generator of claim 34, wherein the left channel high-pass filter is further operable to amplify energy of the left channel signal at or above the first corner frequency to produce the left channel high pass signal; and the right channel high-pass filter is further operable to amplify energy of the right channel signal at or above the second corner frequency to produce the right channel high pass signal.

36. (Original) The sub-harmonic generator of claim 34, wherein:

the left channel summation circuit includes (i) a first summation circuit operable to sum at least the left channel high pass signal and the inverted right channel signal to produce a left expansion signal, and (ii) a second summation circuit operable to sum at least the left channel signal and the left expansion signal to produce at least a portion of the left channel output signal; and

the right channel summation circuit includes (i) a first summation circuit operable to sum at least the right channel high pass signal and the inverted left channel signal to produce a right expansion signal, and (ii) a second summation circuit operable to sum at least the right channel

signal and the right expansion signal to produce at least a portion of the right channel output signal.

37. (Original) The sub-harmonic generator of claim 36, wherein the stereo width expansion circuit further includes a left channel adjustment control operable to vary a magnitude of the left expansion signal and a right channel adjustment control operable to vary a magnitude of the right expansion signal.

38. (Original) A sub-harmonic generator, comprising:

a sub-harmonic signal circuit operable to (i) receive an input signal containing frequencies from among a first range, (ii) filter the input signal to produce a first intermediate signal containing frequencies from among a second range, and (iii) produce a sub-harmonic signal from the first intermediate signal containing frequencies from among a third range, the third range of frequencies being about one octave below the second range of frequencies;

at least one band-pass filter operable to receive the input signal and to produce a second intermediate signal containing frequencies from among a fourth range, the fourth range of frequencies including at least some frequencies above the third range of frequencies;

an amplifier operable to increase an amplitude of the second intermediate signal to produce a third intermediate signal; and

a summation circuit operable to sum the sub-harmonic signal and the third intermediate signal to produce at least a portion of an output signal.

39. (Original) The sub-harmonic generator of claim 38, wherein the at least one band-pass filter includes first, second and third band-pass filters such that a sum of outputs of the first, second, and third band-pass filters exclude frequencies substantially outside the fourth range, the first band-pass filter having a center frequency within about 35 Hz to about 45 Hz, the second band-pass filter having a center frequency within about 55 Hz to about 65 Hz, and the third band-pass filter having a center frequency within about 95 Hz to about 105 Hz.

40. (Original) The sub-harmonic generator of claim 39, wherein the first band-pass filter has a center frequency of about 40 Hz, the second band-pass filter has a center frequency of about 58 Hz, and the third band-pass filter has a center frequency of about 98 Hz.

41. (Original) The sub-harmonic generator of claim 40, wherein the first band-pass filter has a Q-factor within about 1.5 to about 2.0, the second band-pass filter has a Q-factor within about 1.75 to about 2.25, and the third band-pass filter has a Q-factor within about 1.75 to about 2.25.

42. (Original) The sub-harmonic generator of claim 38, further comprising a user adjustment control operable to vary the magnitude of the second intermediate signal.

43. (Original) The sub-harmonic generator of claim 38, further comprising a low pass filter operable to (i) receive the sub-harmonic signal; and (ii) attenuate frequencies substantially below the third range to produce a filtered sub-harmonic signal, the summation circuit being further operable to sum the filtered sub-harmonic signal and the third intermediate signal to produce at least a portion of the output signal.

44. (Original) The sub-harmonic generator of claim 38, wherein the sub-harmonic circuit is further operable to produce a low pass signal containing frequencies from among those below a first corner frequency, and the summation circuit being further operable to sum (i) the sub-harmonic signal; (ii) the third intermediate signal; and (iii) the low pass signal to produce at least a portion of the output signal.

45. (Original) The sub-harmonic generator of claim 38, further comprising:
a summing circuit operable to receive a stereo signal including a left channel signal and a right channel signal, and to aggregate the left and right channel signals to produce the input signal;

a left channel summation circuit operable to sum the left channel signal and the third intermediate signal to produce at least a portion of a left channel output signal; and

a right channel summation circuit operable to sum the right channel signal and the third intermediate signal to produce at least a portion of a right channel output signal.

46. (Original) The sub-harmonic generator of claim 45, further comprising stereo width expansion circuit operable to (i) cancel energy at at least some frequencies from among a fifth range of frequencies from the left channel signal to produce at least a portion of the left channel output

signal; and (ii) cancel energy at at least some frequencies from among a sixth range of frequencies from the right channel signal to produce at least a portion of the right channel output signal.

47. (Original) The sub-harmonic generator of claim 46, wherein the stereo width expansion circuit includes:

a left channel band-pass filter having a center frequency at about a mid-frequency of the sixth range of frequencies, the left channel band-pass filter being operable to produce an inverted left channel signal containing a band of frequencies from among the sixth range of frequencies;

a right channel band-pass filter having a center frequency at about a mid-frequency of the fifth range of frequencies, the right channel band-pass filter being operable to produce an inverted right channel signal containing a band of frequencies from among the fifth range of frequencies;

a left channel summation circuit operable to sum at least the left channel signal and the inverted right channel signal to produce at least a portion of the left channel output signal; and

a right channel summation circuit operable to sum at least the right channel signal and the inverted left channel signal to produce at least a portion of the right channel output signal.

48. (Original) The sub-harmonic generator of claim 47, wherein:

the inverted left channel signal has frequency, amplitude and phase characteristics such that energy of the right channel signal at frequencies from among the sixth range of frequencies are substantially attenuated when the right channel signal and the inverted left channel signal are summed to produce at least a portion of the right channel output signal; and

the inverted right channel signal has frequency, amplitude and phase characteristics such that energy of the left channel signal at frequencies from among the fifth range of frequencies are substantially attenuated when the left channel signal and the inverted right channel signal are summed to produce at least a portion of the left channel output signal.

49. (Original) The sub-harmonic generator of claim 47, wherein a center frequency of one of the left channel band-pass filter and the right channel band-pass filter is within about 175 Hz to about 225 Hz and a center frequency of the other of the left channel band-pass filter and the right channel band-pass filter is within about 150 Hz to about 200 Hz.

50. (Original) The sub-harmonic generator of claim 47, wherein a center frequency of one of the left channel band-pass filter and the right channel band-pass filter is about 200 Hz and a center frequency of the other of the left channel band-pass filter and the right channel band-pass filter is about 175 Hz.

51. (Original) The sub-harmonic generator of claim 47, wherein:

the stereo width expansion circuit further includes a left channel high-pass filter operable receive the left channel signal and to produce a left channel high pass signal containing frequencies from among those at or above a first corner frequency, and a right channel high-pass filter operable to receive the right channel signal and to produce a right channel high pass signal containing frequencies from among those at or above a second corner frequency;

the left channel summation circuit is further operable to sum at least the left channel signal, the inverted right channel signal, and the left channel high pass signal to produce at least a portion of the left channel output signal; and

the right channel summation circuit is further operable to sum at least the right channel signal, the inverted left channel signal, and the right channel high pass signal to produce at least a portion of the right channel output signal.

52. (Original) The sub-harmonic generator of claim 51, wherein

the left channel high-pass filter is further operable to amplify energy of the left channel signal at or above the first corner frequency to produce the left channel high pass signal; and

the right channel high-pass filter is further operable to amplify energy of the right channel signal at or above the second corner frequency to produce the right channel high pass signal.

53. (Original) The sub-harmonic generator of claim 51, wherein:

the left channel summation circuit includes (i) a first summation circuit operable to sum at least the left channel high pass signal and the inverted right channel signal to produce a left expansion signal, and (ii) a second summation circuit operable to sum at least the left channel signal and the left expansion signal to produce at least a portion of the left channel output signal; and

the right channel summation circuit includes (i) a first summation circuit operable to sum at least the right channel high pass signal and the inverted left channel signal to produce a right

expansion signal, and (ii) a second summation circuit operable to sum at least the right channel signal and the right expansion signal to produce at least a portion of the right channel output signal.

54. (Original) The sub-harmonic generator of claim 53, wherein the stereo width expansion circuit further includes a left channel adjustment control operable to vary a magnitude of the left expansion signal and a right channel adjustment control operable to vary a magnitude of the right expansion signal.

55. (Original) An expansion circuit for increasing an apparent stereo width produced by a left channel signal and a right channel signal, comprising:

a left channel circuit operable to cancel energy at at least some frequencies from among a first range of frequencies from the left channel signal to produce at least a portion of a left channel output signal, the at least some frequencies from among the first range of frequencies being derived from the right channel signal; and

a right channel circuit operable to cancel energy at at least some frequencies from among a second range of frequencies from the right channel signal to produce at least a portion of a right channel output signal, the at least some frequencies from among the second range of frequencies being derived from the left channel signal.

56. (Original) The expansion circuit of claim 55, wherein:

the left channel circuit includes a left channel band-pass filter having a center frequency at about a mid-frequency of the second range of frequencies, the left channel band-pass filter being operable to produce an inverted left channel signal containing a band of frequencies from among the second range of frequencies;

the right channel circuit includes a right channel band-pass filter having a center frequency at about a mid-frequency of the first range of frequencies, the right channel band-pass filter being operable to produce an inverted right channel signal containing a band of frequencies from among the first range of frequencies;

the left channel circuit further includes a left channel summation circuit operable to sum at least the left channel signal and the inverted right channel signal to produce at least a portion of the left channel output signal; and

the right channel circuit further includes a right channel summation circuit operable to sum at least the right channel signal and the inverted left channel signal to produce at least a portion of the right channel output signal.

57. (Original) The expansion circuit of claim 56, wherein:

the inverted left channel signal has frequency, amplitude and phase characteristics such that energy of the right channel signal at frequencies from among the second range of frequencies are substantially attenuated when the right channel signal and the inverted left channel signal are summed to produce at least a portion of the right channel output signal; and

the inverted right channel signal has frequency, amplitude and phase characteristics such that energy of the left channel signal at frequencies from among the first range of frequencies are substantially attenuated when the left channel signal and the inverted right channel signal are summed to produce at least a portion of the left channel output signal.

58. (Original) The expansion circuit of claim 56, wherein a center frequency of one of the left channel band-pass filter and the right channel band-pass filter is within about 175 Hz to about 225 Hz and a center frequency of the other of the left channel band-pass filter and the right channel band-pass filter is within about 150 Hz to about 200 Hz.

59. (Original) The expansion circuit of claim 56, wherein a center frequency of one of the left channel band-pass filter and the right channel band-pass filter is about 200 Hz and a center frequency of the other of the left channel band-pass filter and the right channel band-pass filter is about 175 Hz.

60. (Original) The expansion circuit of claim 56, wherein:

the left channel circuit further includes a left channel high-pass filter operable receive the left channel signal and to produce a left channel high pass signal containing frequencies from among those at or above a first corner frequency;

the right channel circuit further includes a right channel high-pass filter operable to receive the right channel signal and to produce a right channel high pass signal containing frequencies from among those at or above a second corner frequency;

the left channel summation circuit is further operable to sum at least the left channel signal, the inverted right channel signal, and the left channel high pass signal to produce at least a portion of the left channel output signal; and

the right channel summation circuit is further operable to sum at least the right channel signal, the inverted left channel signal, and the right channel high pass signal to produce at least a portion of the right channel output signal.

61. (Original) The expansion circuit of claim 60, wherein

the left channel high-pass filter is further operable to amplify energy of the left channel signal at or above the first corner frequency to produce the left channel high pass signal; and

the right channel high-pass filter is further operable to amplify energy of the right channel signal at or above the second corner frequency to produce the right channel high pass signal.

62. (Original) The expansion circuit of claim 60, wherein:

the left channel summation circuit includes (i) a first summation circuit operable to sum at least the left channel high pass signal and the inverted right channel signal to produce a left expansion signal, and (ii) a second summation circuit operable to sum at least the left channel signal and the left expansion signal to produce at least a portion of the left channel output signal; and

the right channel summation circuit includes (i) a first summation circuit operable to sum at least the right channel high pass signal and the inverted left channel signal to produce a right expansion signal, and (ii) a second summation circuit operable to sum at least the right channel signal and the right expansion signal to produce at least a portion of the right channel output signal.

63. (Original) The expansion circuit of claim 62, wherein the stereo width expansion circuit further includes a left channel adjustment control operable to vary a magnitude of the left expansion signal and a right channel adjustment control operable to vary a magnitude of the right expansion signal.

64. (Original) The expansion circuit of claim 60, wherein the first corner frequency is about 5.3 KHz.

65. (Original) The expansion circuit of claim 60, wherein the first and second corner frequencies are about 5.3 KHz.

66. (Currently Amended) A method of producing a sub-harmonic signal, comprising:

producing a first intermediate signal from an input signal containing frequencies from among a first range such that the first intermediate signal contains frequencies from among a second range;

producing a square wave signal from the first intermediate signal such that the square wave signal contains square wave signal components at fundamental frequencies from among a third range, the third range of frequencies being about one octave below the second range of frequencies;

producing a second intermediate signal from the square wave signal <u>at least partially by attenuating frequencies of the square wave signal substantially outside the third range</u> such that the second intermediate signal contains sinusoidal signal components from among frequencies corresponding to the respective fundamental frequencies of the square wave signal components;

producing an RMS signal corresponding to an instantaneous amplitude of the first intermediate signal; and

amplifying the second intermediate signal by an amount proportional to the RMS signal to produce the sub-harmonic signal.

67. (Previously Presented) The method of claim 66, wherein the second range is contained within the first range.

68. (Previously Presented) The method of claim 67, wherein the second range is about 40 Hz to about 110 Hz.

69. (Previously Presented) The method of claim 67, wherein the second range is about 56 Hz to about 96 Hz.

70. (Previously Presented) The method of claim 66, wherein the step of producing the square wave signal includes producing a zero crossing signal that transitions each time the first intermediate signal substantially matches a reference potential.

71. (Previously Presented) The method of claim 70, wherein the step of producing the zero crossing signal includes:

comparing respective amplitudes of the reference potential and the first intermediate signal; and transitioning the zero crossing signal each time the amplitude of the reference potential substantially equals the first intermediate signal.

72. (Previously Presented) The method of claim 70, wherein the step of producing the square wave signal further includes transitioning the square wave signal one time each time the zero crossing signal transitions two times.

73. (Previously Presented) The method of claim 72, wherein the third range of frequencies is about 20 Hz to about 55 Hz.

74. (Previously Presented) The method of claim 72, wherein the third range of frequencies is about 28 Hz to about 48 Hz.

75. (Previously Presented) The method of claim 66, wherein the step of producing the second intermediate signal includes attenuating frequencies substantially outside the third range from the square wave signal such that the second intermediate signal contains the sinusoidal signal components at frequencies corresponding to the respective fundamental frequencies of the square wave signal components.

76. (Previously Presented) The method of claim 75, wherein the third range is about 25 Hz to about 50 Hz.

77. (Previously Presented) The method of claim 75, further comprising adjusting the attenuated frequencies that are substantially outside the third range.

78. (Previously Presented) The method of claim 66, further comprising:

producing a third intermediate signal from the input signal such that the third intermediate

signal contains frequencies from among a fourth range, the fourth range of frequencies including at least some frequencies above the third range of frequencies;

producing a fourth intermediate signal by increasing an amplitude of the third intermediate signal; and

summing the sub-harmonic signal and the fourth intermediate signal to produce at least a portion of an output signal.

79. (Previously Presented) The method of claim 78, wherein the fourth range is about 35 Hz to about 105 Hz.

80. (Previously Presented) The method of claim 79, wherein the fourth range is about 40 Hz to about 98 Hz.

81. (Previously Presented) The method of claim 78, further comprising varying the magnitude of the third intermediate signal.

82. (Previously Presented) The method of claim 78, wherein the step of producing at least a portion of the output signal further includes:

attenuating frequencies of the sub-harmonic signal substantially below the third range to produce a filtered sub-harmonic signal; and

summing the filtered sub-harmonic signal and the fourth intermediate signal to produce at least a portion of the output signal.

83. (Previously Presented) The method of claim 66, further comprising:

producing a low pass signal from the input signal such that it contains frequencies from among the third range of frequencies;

producing a fourth intermediate signal by increasing an amplitude of the third intermediate signal; and

summing the sub-harmonic signal, the fourth intermediate signal, and the low pass signal to produce at least a portion of the output signal.

84. (Previously Presented) The method of claim 66, further comprising aggregating a left channel signal and a right channel signal of a stereo signal to produce the input signal.

85. (Previously Presented) The method of claim 84, further comprising:

producing a third intermediate signal from the input signal such that it contains frequencies from among a fourth range, the fourth range of frequencies including at least some frequencies above the third range of frequencies;

increasing an amplitude of the third intermediate signal to produce a fourth intermediate signal;

summing the left channel signal and the fourth intermediate signal to produce at least a portion of a left channel output signal; and

summing the right channel signal and the fourth intermediate signal to produce at least a portion of a right channel output signal.

86. (Previously Presented) The method of claim 84, further comprising:

canceling energy at at least some frequencies from among a fourth range of frequencies from the left channel signal to produce at least a portion of a left channel output signal; and

canceling energy at at least some frequencies from among a fifth range of frequencies from the right channel signal to produce at least a portion of a right channel output signal.

87. (Previously Presented) The method of claim 86, further comprising:

producing an intermediate left channel signal from the left channel signal containing a band of frequencies from among the fifth range of frequencies;

producing an intermediate right channel signal from the right channel signal containing a band of frequencies from among the fourth range of frequencies;

subtracting the intermediate right channel signal from the left channel signal to produce at least a portion of the left channel output signal; and

subtracting the intermediate left channel signal from the right channel signal to produce at least a portion of the right channel output signal.

88. (Previously Presented) The method of claim 87, wherein:

the intermediate left channel signal has frequency, amplitude and phase characteristics such that energy of the right channel signal at frequencies from among the fifth range of frequencies are substantially attenuated when the intermediate left channel signal is subtracted from the right channel signal; and

the intermediate right channel signal has frequency, amplitude and phase characteristics such that energy of the left channel signal at frequencies from among the fourth range of frequencies are substantially attenuated when the intermediate right channel signal is subtracted from the left channel signal.

89. (Previously Presented) The method of claim 87, wherein one of the fourth and fifth ranges of frequencies is about 175 Hz to about 225 Hz and the other of the fourth and fifth ranges of frequencies is about 150 Hz to about 200 Hz.

90. (Previously Presented) The method of claim 87, wherein a center frequency of one of the fourth and fifth ranges of frequencies is about 200 Hz and a center frequency of the other of the fourth and fifth ranges of frequencies is about 175 Hz.

91. (Previously Presented) The method of claim 87, further comprising:

producing a left channel high pass signal from the left channel signal such that it contains frequencies from among those at or above a first corner frequency;

producing a right channel high pass signal from the right channel signal such that it contains frequencies from among those at or above a second corner frequency;

aggregating at least the left channel signal, the intermediate right channel signal, and the left channel high pass signal to produce at least a portion of the left channel output signal; and

aggregating at least the right channel signal, the intermediate left channel signal, and the right channel high pass signal to produce at least a portion of the right channel output signal.

92. (Previously Presented) The method of claim 91, wherein:

the step of producing the left channel high-pass signal includes amplifying energy of the left channel signal at or above the first corner frequency to produce the left channel high pass signal; and

the step of producing the right channel high-pass signal includes amplifying energy of the

right channel signal at or above the second corner frequency to produce the right channel high pass signal.

93. (Previously Presented) The method of claim 91, wherein:

the step of producing at least a portion of the left channel output signal includes (i) aggregating at least the left channel high pass signal and the intermediate right channel signal to produce a left expansion signal, and (ii) summing at least the left channel signal and the left expansion signal to produce at least a portion of the left channel output signal; and

the step of producing at least a portion of the right channel output signal includes (i) aggregating at least the right channel high pass signal and the intermediate left channel signal to produce a right expansion signal, and (ii) summing at least the right channel signal and the right expansion signal to produce at least a portion of the right channel output signal.

94. (Previously Presented) The method of claim 93, further comprising varying a magnitude of the left expansion signal and a magnitude of the right expansion signal.

95. (Previously Presented) A method, comprising:

filtering an input signal containing frequencies from among a first range to produce a first intermediate signal containing frequencies from among a second range;

producing a sub-harmonic signal from the first intermediate signal such that it contains frequencies from among a third range, the third range of frequencies being about one octave below the second range of frequencies;

producing a second intermediate signal from the input signal such that it contains frequencies from among a fourth range, the fourth range of frequencies including at least some frequencies above the third range of frequencies;

producing a third intermediate signal by increasing an amplitude of the second intermediate signal; and

summing the sub-harmonic signal and the third intermediate signal to produce at least a portion of an output signal.

96. (Previously Presented) The method of claim 95, wherein the fourth range is about 35 Hz

to about 105 Hz.

97. (Previously Presented) The method of claim 95, wherein the fourth range is about 40 Hz to about 98 Hz.

98. (Previously Presented) The method of claim 95, further comprising varying the magnitude of the second intermediate signal.

99. (Previously Presented) The method of claim 95, wherein the step of producing at least a portion of the output signal further includes:

attenuating frequencies of the sub-harmonic signal substantially below the third range to produce a filtered sub-harmonic signal; and

summing the filtered sub-harmonic signal and the third intermediate signal to produce at least a portion of the output signal.

100. (Previously Presented) The method of claim 95, wherein the step of producing at least a portion of the output signal further includes:

producing a low pass signal from the input signal that contains frequencies from among those within the first and second ranges; and

summing the sub-harmonic signal, the third intermediate signal, and the low pass signal to produce at least a portion of the output signal.

101. (Previously Presented) The method of claim 95, further comprising:

aggregating a left channel signal and a right channel signal of a stereo signal to produce the input signal;

summing the left channel signal and the third intermediate signal to produce at least a portion of a left channel output signal; and

summing the right channel signal and the third intermediate signal to produce at least a portion of a right channel output signal.

102. (Previously Presented) The method of claim 101, further comprising:

canceling energy at at least some frequencies from among a fifth range of frequencies from the left channel signal to produce at least a portion of a left channel output signal; and

canceling energy at at least some frequencies from among a sixth range of frequencies from the right channel signal to produce at least a portion of a right channel output signal.

103. (Previously Presented) The method of claim 102, further comprising:

producing an intermediate left channel signal from the left channel signal containing a band of frequencies from among the sixth range of frequencies;

producing an intermediate right channel signal from the right channel signal containing a band of frequencies from among the fifth range of frequencies;

subtracting the intermediate right channel signal from the left channel signal to produce at least a portion of the left channel output signal; and

subtracting the intermediate left channel signal from the right channel signal to produce at least a portion of the right channel output signal.

104. (Previously Presented) The method of claim 103, wherein:

the intermediate left channel signal has frequency, amplitude and phase characteristics such that energy of the right channel signal at frequencies from among the sixth range of frequencies are substantially attenuated when the intermediate left channel signal is subtracted from the right channel signal; and

the intermediate right channel signal has frequency, amplitude and phase characteristics such that energy of the left channel signal at frequencies from among the fifth range of frequencies are substantially attenuated when the intermediate right channel signal is subtracted from the left channel signal.

105. (Previously Presented) The method of claim 103, wherein one of the fifth and sixth ranges of frequencies is about 175 Hz to about 225 Hz and the other of the fifth and sixth ranges of frequencies is about 150 Hz to about 200 Hz.

106. (Previously Presented) The method of claim 103, wherein a center frequency of one of the fifth and sixth ranges of frequencies is about 200 Hz and a center frequency of the other of the

fifth and sixth ranges of frequencies is about 175 Hz.

107. (Previously Presented) The method of claim 103, further comprising:

producing a left channel high pass signal from the left channel signal such that it contains frequencies from among those at or above a first corner frequency;

producing a right channel high pass signal from the right channel signal such that it contains frequencies from among those at or above a second corner frequency;

aggregating at least the left channel signal, the intermediate right channel signal, and the left channel high pass signal to produce at least a portion of the left channel output signal; and

aggregating at least the right channel signal, the intermediate left channel signal, and the right channel high pass signal to produce at least a portion of the right channel output signal.

108. (Previously Presented) The method of claim 107, wherein:

the step of producing the left channel high-pass signal includes amplifying energy of the left channel signal at or above the first corner frequency to produce the left channel high pass signal; and

the step of producing the right channel high-pass signal includes amplifying energy of the right channel signal at or above the second corner frequency to produce the right channel high pass signal.

109. (Previously Presented) The method of claim 107, wherein:

the step of producing at least a portion of the left channel output signal includes (i) aggregating at least the left channel high pass signal and the intermediate right channel signal to produce a left expansion signal, and (ii) summing at least the left channel signal and the left expansion signal to produce at least a portion of the left channel output signal; and

the step of producing at least a portion of the right channel output signal includes (i) aggregating at least the right channel high pass signal and the intermediate left channel signal to produce a right expansion signal, and (ii) summing at least the right channel signal and the right expansion signal to produce at least a portion of the right channel output signal.

110. (Previously Presented) The method of claim 109, further comprising varying a magnitude of the left expansion signal and a magnitude of the right expansion signal.

111. (Previously Presented) A method for increasing an apparent stereo width produced by a left channel signal and a right channel signal of a stereo signal, comprising:

canceling energy at at least some frequencies from among a first range of frequencies from the left channel signal to produce at least a portion of a left channel output signal, the at least some frequencies from among the first range of frequencies being derived from the right channel signal; and

canceling energy at at least some frequencies from among a second range of frequencies from the right channel signal to produce at least a portion of a right channel output signal, the at least some frequencies from among the second range of frequencies being derived from the left channel signal.

112. (Previously Presented) The method of claim 111, further comprising:

producing an intermediate left channel signal from the left channel signal containing a band of frequencies from among the second range of frequencies;

producing an intermediate right channel signal from the right channel signal containing a band of frequencies from among the first of frequencies;

subtracting the intermediate right channel signal from the left channel signal to produce at least a portion of the left channel output signal; and

subtracting the intermediate left channel signal from the right channel signal to produce at least a portion of the right channel output signal.

113. (Previously Presented) The method of claim 112, wherein:

the intermediate left channel signal has frequency, amplitude and phase characteristics such that energy of the right channel signal at frequencies from among the second range of frequencies are substantially attenuated when the intermediate left channel signal is subtracted from the right channel signal; and

the intermediate right channel signal has frequency, amplitude and phase characteristics such that energy of the left channel signal at frequencies from among the first of frequencies are substantially attenuated when the intermediate right channel signal is subtracted from the left channel signal.

114. (Previously Presented) The method of claim 112, wherein one of the first and second ranges of frequencies is about 175 Hz to about 225 Hz and the other of the first and second ranges of frequencies is about 150 Hz to about 200 Hz.

115. (Previously Presented) The method of claim 112, wherein a center frequency of one of the first and second ranges of frequencies is about 200 Hz and a center frequency of the other of the first and second ranges of frequencies is about 175 Hz.

116. (Previously Presented) The method of claim 112, further comprising:

producing a left channel high pass signal from the left channel signal such that it contains frequencies from among those at or above a first corner frequency;

producing a right channel high pass signal from the right channel signal such that it contains frequencies from among those at or above a second corner frequency;

aggregating at least the left channel signal, the intermediate right channel signal, and the left channel high pass signal to produce at least a portion of the left channel output signal; and

aggregating at least the right channel signal, the intermediate left channel signal, and the right channel high pass signal to produce at least a portion of the right channel output signal.

117. (Previously Presented) The method of claim 116, wherein:

the step of producing the left channel high-pass signal includes amplifying energy of the left channel signal at or above the first corner frequency to produce the left channel high pass signal; and

the step of producing the right channel high-pass signal includes amplifying energy of the right channel signal at or above the second corner frequency to produce the right channel high pass signal.

118. (Previously Presented) The method of claim 116, wherein:

the step of producing at least a portion of the left channel output signal includes (i) aggregating at least the left channel high pass signal and the intermediate right channel signal to produce a left expansion signal, and (ii) summing at least the left channel signal and the left expansion signal to produce at least a portion of the left channel output signal; and

the step of producing at least a portion of the right channel output signal includes (i) aggregating at least the right channel high pass signal and the intermediate left channel signal to produce a right expansion signal, and (ii) summing at least the right channel signal and the right expansion signal to produce at least a portion of the right channel output signal.

119. (Previously Presented) The method of claim 118, further comprising varying a magnitude of the left expansion signal and a magnitude of the right expansion signal.

120. (Previously Presented) The method of claim 116, wherein at least one of the first and second corner frequencies are about 5.3 KHz.

121. (Currently Amended) A sub-harmonic generator, comprising:

a signal divider circuit operable to receive a signal containing frequencies from among a first range and to produce a square wave signal containing square wave signal components at fundamental frequencies from among a second range of frequencies about one octave below the first range of frequencies;

a wave-shaping circuit operable to receive the square wave signal and to at least partially attenuate frequencies substantially outside the third range from the square wave signal to produce an intermediate signal containing sinusoidal signal components based on the square wave signal; and

a voltage controlled amplifier operable to amplify the intermediate signal by an amount proportional to an instantaneous amplitude of the signal to produce a sub-harmonic signal.

122. (Previously Presented) A sub-harmonic generator, comprising:

a sub-harmonic signal circuit operable to produce a sub-harmonic signal from a first signal containing frequencies from among a first range of frequencies such that the sub-harmonic signal contains frequencies from among a second range of frequencies being about one octave below the first range of frequencies;

at least one band-pass filter operable to produce an intermediate signal containing frequencies from among a third range of frequencies including at least some frequencies above the second range of frequencies; and

a summation circuit operable to sum the sub-harmonic signal and the intermediate signal to

produce at least a portion of an output signal.

123. (Currently Amended) A method of producing a sub-harmonic signal, comprising:

producing a square wave signal from a signal containing frequencies from among a first range of frequencies such that the square wave signal contains square wave signal components at fundamental frequencies from among a second range of frequencies about one octave below the first range of frequencies;

producing an intermediate signal that contains sinusoidal signal components based on the square wave signal at least partially by attenuating frequencies substantially outside the second range from the square wave signal;

amplifying the intermediate signal by an amount proportional to an instantaneous amplitude of the signal to produce the sub-harmonic signal.

124. (Previously Presented) A method, comprising:

producing a sub-harmonic signal from a signal containing frequencies from among a first range such that it contains frequencies from among a second range of frequencies about one octave below the first range of frequencies;

producing an intermediate signal that contains frequencies from among a third range of frequencies including at least some frequencies above the second range of frequencies; and

summing the sub-harmonic signal and the intermediate signal to produce at least a portion of an output signal.